

REMARKS

In the Office Action, the Examiner rejected claims 1-11. By this Response, Applicants have amended claims 1, 3, and 4 for clarification of certain features to expedite allowance and added new claims 29-31. Upon entry of these amendments, claims 1-11 and 29-31 will be pending and are believed to be in condition for allowance. In view of the foregoing amendments and the following remarks, Applicants respectfully request reconsideration and allowance of all pending claims.

Preliminary Remarks

As a preliminary matter, Applicants note that the Examiner rejected claims 1-11 in the Office Action as being anticipated under Section 102 or as being obvious under Section 103 based upon Göttert et al., U.S. Patent No. 6,482,553 (hereinafter the “Göttert reference”). Applicants further note that the Göttert reference was cited during the prosecution of U.S. Patent Application Serial No. 11/215,938, which is a divisional application (hereinafter the “Divisional Application”) claiming priority to the instant application. During prosecution of the Divisional Application, Applicants amended the claims of the Divisional Application in response to rejections based upon the Göttert reference in order to more clearly distinguish the recited subject matter from the teachings set forth in the Göttert reference. *See, e.g.*, Divisional Application File Wrapper History, Responses to Office Actions mailed on June 1, 2007, November 29, 2007, and June 26, 2008. The amended claims of the Divisional Application were ultimately allowed by Examiner Shawntina Fuqua, resulting in the issuance of the Divisional Application as U.S.

U.S. Patent 7,605,350 on October 20, 2009. *See* Divisional Application File Wrapper History, Notice of Allowance mailed on June 11, 2009.

With the foregoing in mind, Applicants additionally note that the claims pending in the instant application recite methods for soft-baking a semiconductor wafer that generally correspond to the operation of the two-bake systems recited by the claims of the Divisional Application, as originally filed. As discussed above, because certain amendments submitted during the prosecution of the Divisional Application were determined by Examiner Fuqua to distinguish the claims of the Divisional Application from the Göttert reference, ultimately resulting in their allowance, Applicants have amended the claims of the instant application in a similar manner. As discussed in further detail below, the presently submitted amendments are believed to place all pending claims in condition for allowance.

Claim Rejections under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 1, 4, 5, 7, 8, and 11 under 35 U.S.C. § 102(b) as being anticipated by the Göttert reference. Applicants respectfully traverse this rejection.

Legal Precedent

Anticipation under Section 102 can be found only if a single reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 U.S.P.Q.

773 (Fed. Cir. 1985). For a prior art reference to anticipate under Section 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). To maintain a proper rejection under section 102, a single reference must teach each and every limitation of the rejected claim. *Atlas Powder v. E.I. du Pont*, 750 F.2d 1569 (Fed. Cir. 1984). The prior art reference also must show the *identical* invention “*in as complete detail as contained in the ... claim*” to support a *prima facie* case of anticipation. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989). Accordingly, Applicants need only point to a single element not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter.

Götttert is missing features recited by Independent Claim 1

As amended, independent claim 1 recites a method comprising “soft-baking a semiconductor wafer comprising a substrate having a plurality of features formed thereon at a first temperature for a first predetermined period of time, wherein the plurality of features is coated with a resist such that at least one unfilled void is present under the resist and between two of the plurality of features.” (Emphasis added). An illustrative embodiment of these recited claim elements, including the recited “voids,” “features,” and “resist” is depicted in Fig. 1 of the present Application. For instance, as shown in Fig. 1, an unfilled void 20 is formed between the features 14A, and an unfilled void 27 is formed between the features 14B, wherein the resist 18 is disposed over (e.g., coats) the features 14A and 14B, such

14B, such that the unfilled voids 20 and 27 are present under the layer of resist 18.

The above-discussed features of independent claim 1 are believed to be absent from the Göttert reference. In particular, the Göttert reference does not disclose a semiconductor wafer that includes a substrate having a plurality of features. In contrast, Göttert teaches disposing a layer of resist directly on a single, smooth graphite substrate. *See* Göttert, col. 4, lines 3-13; col. 5, lines 41-51. For instance, the Göttert reference clearly states that the graphite layer is prepared *prior* to soft-baking by fly-cutting or polishing to *improve surface uniformity*. *See id.* at col. 4, lines 6-9. Indeed, contrary to the recitations of independent claim 1, it appears that the steps for preparing the graphite substrate of Göttert prior to soft-baking would actually remove any non-uniform “features” on the surface of the graphite substrate, thus rendering it *devoid* of any such features.

Further, because the Göttert reference fails to teach a substrate that includes a plurality of features, Applicants do not believe that Göttert could be reasonably construed as teaching that at least one unfilled void is present between at least two features. Particularly, while Göttert offers some discussion with respect to “stress relief in the resist,” the reference appears to be completely silent with respect to unfilled voids being present under the resist. *See id.* at col. 5, lines 55-57. Accordingly, Applicants respectfully submit that the Göttert reference fails to teach: (1) soft-baking a semiconductor wafer including a substrate having a plurality of features formed thereon;

and (2) at least one unfilled void being present under a resist and between two features on the substrate.

For at least these reasons, no *prima facie* case of anticipation is believed to exist with regard to independent claim 1 based upon the Göttert reference. Accordingly, Applicants respectfully request that the Examiner withdraw the Section 102 rejection of independent claim 1 and its dependent claims.

Göttert is missing features recited by Dependent Claim 4

Claim 4, as amended, depends from claim 1 and recites that during a first predetermined period of time, the resist coating the plurality of features remains fluid and that air trapped in the at least one unfilled void under the resist expands through the resist to the surface. These recited features are believed to be absent from the Göttert reference.

As discussed above with regard to the rejection of independent claim 1, the Göttert reference fails to teach or suggest a plurality of features coated with a resist, much less that at least one unfilled void is present under the resist and between two of the plurality of features. Therefore, Applicants do not believe that Göttert could reasonably be construed as teaching that air trapped in an unfilled void expands through and to the surface of the resist. Accordingly, while claim 4 is believed to be clearly patentable at least by virtue of its dependency from independent claim 1, Applicants believe that claim 4 is also allowable for the subject matter separately recited.

Claim Rejections under 35 U.S.C. § 103(a)

The Examiner rejected claims 2, 3, 6, 9, and 10 under 35 U.S.C. § 103(a) based upon the Göttert reference. Applicants respectfully traverse these rejections.

Legal Precedent

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). In addressing obviousness determinations under 35 U.S.C. § 103, the Supreme Court in *KSR International Co. v. Teleflex Inc.*, No. 04-1350 (April 30, 2007), reaffirmed many of its precedents relating to obviousness including its holding in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). In *KSR*, the Court also reaffirmed that “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *Id.* at 14. In this regard, the *KSR* court stated that “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does ... because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.” *Id.* at 14-15. In *KSR*, the court noted that the demonstration of a teaching, suggestion, or motivation to combine provides a “helpful insight” in determining whether claimed subject matter is obvious. *KSR, slip op.* at 14.

Furthermore, the *KSR* court did not diminish the requirement for objective evidence of obviousness. *Id.* at 14 (“To facilitate review, this analysis should be made explicit. See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ([R]jections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness’). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.”); *see also, In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002) (holding that the factual inquiry whether to combine references must be thorough and searching, and that it must be based on objective evidence of record).

Deficiencies of the Rejection

Claims 2, 3, 6, 9, and 10 each depend from independent claim 1 and were rejected by the Examiner based solely upon the Göttert reference. As discussed above, however, the Göttert reference fails to teach each and every feature recited by independent claim 1. Namely, the Göttert reference fails to teach or suggest a plurality of features coated with a resist and that at least one unfilled void is present under the resist and between two of the plurality of features.

In the Section 103 rejection of claims 2, 3, 6, 9, and 10, the Examiner failed to cite any secondary references to remedy the deficiencies of the Göttert reference. As such,

each of claims 2, 3, 6, 9, and 10 are believed to be clearly patentable at least by virtue of their dependency from independent claim 1. Additionally, as discussed below, claim 3 is also believed to be allowable over the Göttert reference based upon its separately recited subject matter.

Göttert is missing features recited by Dependent Claim 3

Claim 3 recites that during a first predetermined period of time, the resist coating the plurality of features on the substrate hardens and that air trapped in at least one unfilled void under the resist does not possess sufficient energy to expand through the resist. These recited feature are believed to be absent from the Göttert reference.

As discussed above with regard to the rejection of independent claim 1, the Göttert reference fails to teach or suggest a plurality of features coated with a resist, much less that at least one unfilled void is present under the resist and between two of the plurality of features. As such, Applicants do not believe that Göttert could reasonably be construed as teaching that air trapped in an unfilled void does not possess sufficient energy to expand through the resist. Accordingly, Applicants believe that claim 3 is also allowable for the subject matter separately recited.

New Claims

As noted above, the present Response adds new claim 29-31. As discussed below, each of these new claims are believed to be allowable over the Göttert reference.

Dependent Claim 29

Dependent claim 29 depends from independent claim 1 and recites that subsequent to the soft-baking steps (e.g., acts (a) and (b)), the at least one unfilled void remains present under the resist. As discussed above, Göttert fails to even disclose an unfilled void under a resist and, therefore, cannot be reasonably interpreted as disclosing an unfilled void that remains under the resist after a soft-baking process. Accordingly, Applicants respectfully request allowance of dependent claim 29.

Independent Claim 30

Independent claim 30 recites a method for soft-baking a semiconductor wafer that includes a first step of “soft-baking a substrate having a plurality of features coated with a resist at a first temperature for a first predetermined period of time using a first thermal unit” and a subsequent second step of “soft-baking the substrate at a second higher temperature for a second predetermined period of time using a second thermal unit.” (Emphasis added). For example, as disclosed in Applicants’ specification, a first thermal unit may be used for the low-bake temperature (i.e., 30-75 °C), and a second thermal unit may be used for the high-bake temperature (i.e., 90-150 °C). See Application, page 11, lines 5-8. In this example, a wafer is passed from the first thermal unit to the second thermal unit so that the two

thermal unit so that the two thermal units do not cycle between the low-bake and high-bake temperatures. *See id.* at page 11, lines 8-9.

In contrast, the Göttert reference appears to be completely silent as to whether first and second thermal units are used in applying a two-step soft-bake process to a graphite substrate. For instance, the reference merely states:

A two-step soft bake was performed at 65°C for 5 minutes, then at 90°C for 6 minutes. The lower temperature bake was just above the glass transition temperature of the resist, allowing it to flow slowly before the higher temperature bake.

Göttert, col. 5, lines 47-51.

Indeed, after careful review, Applicants are unable to identify any language in the Göttert reference to suggest that the first soft-bake step (e.g., at 65°C) and the second soft-bake step (e.g., at 90°C) are carried out using separate first and second thermal units, respectively. For at least these reasons, Applicants respectfully submit that independent claim 30 and dependent claim 31, which depends therefrom, are allowable over the Göttert reference.

General Authorization for Extensions of Time and Payment of Fees

In accordance with 37 C.F.R. § 1.136, Applicants hereby provide a general authorization to treat this and any future reply requiring an extension of time as incorporating a request therefor. Applicants authorize the Commissioner to charge any fees which may be necessary to advance prosecution of the instant application, including the appropriate fee for any extension of time, to Deposit Account No. 06-1315; Order No. 02-1051; MICS:0117/MAN.

Conclusion

Applicants respectfully submit that all pending claims are in condition for allowance. However, if the Examiner believes certain amendments are necessary to clarify the present claims or if the Examiner wishes to resolve any other issues by way of a telephone conference, the Examiner is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: November 10, 2009

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